SUSTAINABLE MINING
ACKNOWLEDGEMENTS

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The Leading Practice Sustainable Development Program for the Mining Industry (LPSD) is a program that promotes sustainable development and industry self-regulation through proactive adoption of leading practice principles. The program was launched in 2006 and is administered by the Department of Resources, Energy and Tourism (RET).

For more information about the LPSD and to download a copy of the report, visit ret.gov.au/resources/resources_programs/lpsdmining/handbooks/Pages/default.aspx

Austrade gratefully acknowledges the assistance of Associate Professor David Laurence, Australian Centre for Sustainable Mining Practices at the University of NSW, with the preparation of this document.

Cover image: ‘Tree planting involving miners and their families’ by Joel Forte. Snowden Photo Competition 2011. Photo courtesy of Snowden

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LEADING PRACTICE SOLUTIONS USED AROUND THE WORLD
Australia has a mature mining and resources industry built on nearly 200 years of experience.

The strength of Australia’s resource sector has fuelled much of its economic development and helped underpin social development. This growth has also seen the rise of sustainable mining methodologies, where Australian companies have developed leading practice solutions now used in Australia and across the world.

The Australian mining industry is at the forefront of the global pursuit of sustainable mining, recognising that environmental accountability, social responsibility and commercial success are now inseparable concepts.

In recent decades, Australia has developed advanced capabilities in environmental and water management as well as innovative approaches to community engagement and development.

This industry capability statement provides an overview of Australian capabilities in several aspects of sustainable mining: environmental and water management, community engagement and development. It includes examples of some of the many Australian companies with specialist expertise.

Talk to your local Austrade representative for tailored advice and information on connecting and partnering with the Australian mining industry.
Australia has an abundant supply of mineral resources, including the world’s largest reserves of lead, nickel, uranium and zinc. It is a world leader in the production of key mineral commodities including:\(^1\)

1. the world’s leading producer of bauxite, alumina, rutile, zircon and tantalum
2. the second largest producer of gold, iron ore, lead, manganese and lithium
3. the third largest producer of ilmenite, nickel, uranium and zinc
4. the fourth largest producer of black coal and silver
5. the fifth largest producer of aluminium, brown coal, diamonds, and copper.

This wealth of mineral resources, underpinned by significant investment in research and development (A$3.8 billion in 2010-2011)\(^2\), has generated a skilled industry of professionals, advanced extraction processes and cutting-edge technology.

Australia’s mining sector has built a reputation as a world leader in the development and manufacture of mining equipment, technology and services (METS). Australian firms are competitive right across the supply chain, including exploration, engineering, minerals processing, environmental management, mine safety, research and development and education and training.

In the field of sustainable mining, Australian companies have developed leading practice solutions being used in Australia and across the world.

‘Sustainable resource management in Australia is something that’s always been at the forefront of the mining industry. It’s something our communities and our people demand and something the people involved in the mining sector particularly are passionate about.
We plan our mines for mine closure, so we take into account rehabilitation regeneration at the very outset of any mine development.’

Michael Wright
Executive General Manager, Australian Mining
Thiess
The Australian mining industry has considerable experience in bringing together the concepts of environmental accountability, social responsibility and commercial success. Sustainable mining depends on excellence in mine safety and health as well as optimising the extraction of the mineral resource, or resource efficiency.

Australia is a world leader in sustainable mining thanks to a combination of a long history of implementing strong environmental and safety regulations as well as adopting voluntary codes of practice and standards.

This in turn has created a broad framework of ongoing demand for, and the continued development of, innovative technologies and services in sustainable mining practices.

The Minerals Council of Australia’s Enduring Value Framework For Sustainable Development provides critical guidance to mining companies on applying the International Council on Mining and Metals (ICMM) Sustainable Development Framework Principles at an operational level. It also assists the industry to operate in a manner which aligns with community expectations, and which seeks to maximise the long-term benefits to society through the effective management of Australia’s natural resources. All member companies of the Council are required to sign off on the Enduring Value framework.

Conscious of the importance of environmental sustainability, the Australian mining industry has invested heavily in personnel, training, scientific research and development to ensure that the highest environmental, safety and community standards are achieved.
SuStAInABILItY ACROSS THE MInInG LIFE CyCLE

Australia’s mining companies recognise the need to manage their mining and mineral projects in an environmentally and socially responsible manner. To do this, they have developed a range of initiatives and protocols that cover all stages of the mining process, from initial exploration to mine rehabilitation and closure.

These initiatives are further supported and enhanced by the Leading Practice Sustainable Development Program in Mining initiative, which was launched in 2006 by the Australian Government and the mining industry. The program established best-practice procedures that encompass all stages of the mining process and the key issues which affect sustainable mining.

Australian expertise in mining sustainability and social responsibility covers a number of areas across the typical mining project cycle.

‘Australian companies are committed to the management of the resource for its whole life cycle, from the discovery of the resource through the exploitation phase and importantly through the wind-down and the regeneration phase.’

John McGagh
Head of Innovation
RioTinto

Phases of a mining project which need to be considered in evaluating mining sustainability
Building sustainability into design

Case study: sustainability planning

The Frieda River copper mine project in Papua New Guinea is subject to many challenges, including very limited infrastructure in the region (particularly power and transport), high annual rainfall, difficult terrain, acid rock drainage, and complex socio-economic issues.

Xstrata Copper (XCu) commissioned Australian consultancy Sinclair Knight Merz (SKM) to undertake a pre-feasibility study (PFS) of the infrastructure (including power station) components for the project. SKM recognised that adopting a ‘sustainability in design’ approach would help to address these challenges.

XCu engaged SKM to integrate sustainability across the PFS, including the mine planning, process plant and pipeline components undertaken by XCu and other consultants.

SKM prepared the sustainability chapter for XCu’s PFS report, demonstrating the integration of sustainability considerations into the project design, including:

- method for transporting copper concentrate
- method of ore and waste rock haulage
- port location and main access road alignment
- airport location.
INTRODUCTION

INDUSTRY OVERVIEW

INDUSTRY STRENGTHS

COMPANIES AND CAPABILITIES

FURTHER INFORMATION

ENVIRONMENTAL MANAGEMENT

Australia is an ecologically fragile land with diverse climate and landscapes, an environmentally aware population and very stringent laws to protect the environment. This combination has resulted in the development of world-class expertise in environmental management within the mining industry. Australian mining companies are at the forefront of environmental assessment and management and have become a world authority on environmental management. Their capabilities include:

- environmental baseline data collection, including surface and groundwater quality and quantity, soil types, fauna and vegetation types and meteorological data
- waste rock characterisation and preliminary assessment, including testing of sulphide ore bodies for acid-based accounting and metals
- feasibility planning to support the mine evaluation process, including economic, environmental and social impact assessment
- Environmental Impact Assessments and Social Impact Assessments
- managing the social and environmental impact of surface disturbance
- managing the environmental and social impact of a temporary workforce, including contractors and sub-contractors
- developing robust environmental management systems and community engagement initiatives suitable for use throughout the mine life cycle
- developing and implementing risk management techniques to manage and mitigate environmental impact during the operations phase
- ameliorating the negative effects of unexpected or unplanned closures through using a more integrated approach to mine closure planning, including community engagement
- best-practice rehabilitation planning and implementation through leading in landform design, topsoil usage and revegetation outcomes
- biodiversity management to minimise long-term impacts from operations, including opportunities for improvement in the lease and adjacent areas by introducing innovative and sustainable land management practices
- monitoring and measuring the performance of closure and rehabilitation activities against the agreed standards and criteria
- leading-practice techniques during the operation of the mine to reduce the potential for long-term issues associated with acid mine drainage
- evolved understanding, regulation and management of carbon emissions
- sound emission regulation and industry identification and management processes and technologies.

‘Australia is at the forefront of environmental sustainability research, particularly as applied to the mining and mineral sector.’

Ian Dover
Director, Business Development and Commercialisation
Minerals Down Under Flagship
CSIRO

SUSTAINABLE MINING
Regeneration at the Boddington Gold Mine

SUSTAINABLE MINING
Leading the way in Brazil

Case study: environmental and social programs

Australian consultancy WorleyParsons is helping the Juruti Mine project in Brazil to achieve world's best practice environmental standards.

Located in the west of the State of Pará, the Juruti Bauxite Aluminum Mining Complex Project includes the bauxite mine, a port and a 60km railroad linking the two.

The project began in 2000. Through its wholly owned Brazilian entity, CNEC, WorleyParsons has been involved since 2001 and has been responsible for preparing the Environment, Social and Health Impact Assessment (ESHIA) and implementing 35 environmental and social programs during project design and construction. WorleyParsons continues to provide environmental monitoring support for the project.

Key project achievements to date include:

1. The integration between engineering and environmental areas, which enabled the achievement of the environmental licences within the timeframe.

2. Among the 35 environmental and social programs, the Support for Family Agriculture Program was awarded First Prize in Environmental Initiatives by Alcoa Brazil in 2008 in the Community Relations category and received the gold trophy as the Best Project of All Categories.

3. The quality of services offered by WorleyParsons and the good relationship with Alcoa allowed the WorleyParsons Environment team to be involved during the entire life cycle of Juruti Project, from 2001 until 2010 when the Operation Licence was granted. In 2011, an additional environmental monitoring contract for two and a half years was awarded to WorleyParsons.
Community Engagement and Development

The mining services sector is an important part of the Australian community as an employer and wealth creator. The Australian mining industry works closely with communities to ensure positive relations between the mining operation and the community. Community engagement and development are a key part of the Leading Practice Sustainable Development for the Mining Industry program and Australian mining companies are at the forefront of global best practice in these areas.4

In addition, Australian investment in exploration and mining activities in developing countries has increased exponentially in recent years, and a demonstrated track record in working with local communities and environments has been crucial to the success of these projects. It is estimated that there were more than 230 Australian resources companies active in Africa in mid-2011, with more than 650 projects in 42 countries (more than 40 per cent of all Australian overseas mining projects).5

Research and development activity associated with new mining operations is directed towards ensuring that the mine sites adhere to best environmental practices and that the workforce and surrounding communities are fully involved in the process.

Companies need to secure broad community support and acceptance in order to maintain their ‘social licence to operate’. From local and international experience, Australian mining services companies and service providers have developed capabilities that include:

- community engagement planning and communication including stakeholder identification and analysis and socio-economic and social impact assessment
- mine closure planning, including mine closure issues, and the integration of economic, environmental and social elements into the decision-making process
- managing community engagement and communication activities during the construction phase
- managing risk and mitigating associated impact on an individual mine, company and the mining industry
- managing the environmental and social impact of a temporary workforce, including contractors and subcontractors
- identifying and leveraging opportunities for Indigenous participation in the workforce
- planning and developing an effective monitoring framework
- water management, including eliminating acid mine drainage risk
Preserving cultural heritage in Lihir

Case study: community engagement

The Lihir gold mine is located on the largest island of the Lihir Group of Islands in Papua New Guinea. The mining operation commenced in 1995 after an Integrated Benefits Package (IBP) agreement was reached with the Lihirian community, the government and the Lihir Management Company (LMC), a wholly owned subsidiary of Rio Tinto.

In 2005 Lihir Gold Limited (LGL) assumed ownership and management of the operation and in 2010 LGL merged with Newcrest Mining Limited.

Following pre-mining social impact assessment studies in the 1980s and concerns expressed by community leaders about the need to strengthen and preserve Lihirian culture, in 1998 LMC established a Cultural Information Office, managed by a senior Lihirian. This office documented major sacred sites and cultural practices and organised various cultural festivals.

In 2009 LGL extended its investment in Lihirian cultural heritage management, in keeping with the sustainable development principles of the International Council on Mining and Metals.

The Lihir Cultural Information Office initiated the establishment of a Lihir-wide representative cultural heritage committee. In mid-2009, an island-wide workshop was held to enable the committee to develop a draft cultural heritage management plan (CHMP) aligned with internationally recognised heritage standards.

The CHMP’s first priority project, official registration of a Lihir Cultural Heritage Association, was achieved in 2010 and the Association has since completed a number of projects.

Case study courtesy of Department of Resources, Energy and Tourism ret.gov.au
Mines and vines at Beltana

Case study: community engagement

‘By taking the time to listen to local landowners and address their individual concerns, we were able to work together throughout the various stages of the project to achieve a positive result for both the mine and the community.’

David O’Brien, General Manager Environment and Community, Xstrata Coal NSW

Mining company Xstrata has pioneered a vineyard monitoring program for its Bulga Coal mine. The mine is located in the Hunter Valley, New South Wales, one of Australia’s best-known wine producing regions.

In the mid-1990s, Xstrata applied for coal exploration licences to investigate an area beneath 40 commercial vineyards and near a significant local watercourse. Mining under operational vineyards was a first for Australia, possibly the world, and local residents expressed concerns about the potential impact on local viticulture and water resources.

In response, Xstrata formed a specific project team and a community consultation committee. With input from the community, academics and consultants, Xstrata constructed a simulated vineyard over the existing South Bulga underground mine, to assess the impacts of subsidence on the vineyard infrastructure. It kept stakeholders regularly updated on the progress of viticulture trials.

The Environmental Impact Statement for the continuation of South Bulga’s underground workings to the new Beltana highwall, longwall punch mine included development of more detailed impact assessments for each property to be undermined and tailored individual management strategies to be given to each property owner. Xstrata then established a comprehensive consultation program for the ongoing management of the mine.

Case study courtesy of Department of Resources, Energy and Tourism ret.gov.au
**WATER MANAGEMENT**

Australian mining companies and their services providers have vast experience in the management of drought and flood conditions, which has placed the Australian water industry in a unique position to offer significant capabilities and strengths in the management of water resources in the mining industry.

Each year, exploration and mining of Australia’s mineral resources consumes four per cent of the nation’s available water supply, or almost 600 gigalitres. Australia’s mine sites are often in remote locations and arid areas, making the securing of adequate water supplies a particular challenge.

Backed by a strong governance framework, Australian water businesses have produced innovative products, services and solutions to address the challenges of water management. As other nations begin to address the effects of climate change and look to secure their own water futures, Australia is well placed to offer insights from its experience in building resilience into water systems.

Australian water industry consultants working in the planning and delivery of mine projects have a wealth of experience in dealing with issues such as remoteness, too little or too much water, lack of easily accessible power and harsh operating conditions for both equipment and personnel.

Australian capabilities in mine management include the following water considerations in resource development and design:

- water supply – identification and quantification
- impacts of water abstraction/diversion on local water resources/users
- government approvals
- water supply, storage and treatment (design and construction)
- dust suppression and dewatering discharge
- waste water treatment and disposal
- site stormwater management
- acid rock drainage management

GHD helps Centennial Coal optimise water management

Case study: water management

Effective water management practices can improve efficiencies through a mine’s life while at the same time minimising environmental impacts. Recognising this, and concerned with the management of water resources at some of its mine sites, the Centennial Coal Group (Centennial) sought to better understand the demands on its processing activities and engaged Australian firm GHD to assist.

Centennial supplies thermal coals to the Australian domestic and export markets. The company operates a number of mines in the Lake Macquarie and Western regions of New South Wales (NSW) and is a major supplier to the NSW energy industry, fuelling around 40 per cent of the state’s coal-fired electricity.

GHD is an international network of engineers, architects and environmental scientists serving clients in the global markets of water, energy and resources.

With GHD’s help, Centennial began an assessment program to determine water management capabilities at its mine sites. This involved developing detailed water balances for existing and future operational conditions, as well as groundwater models. In this process, multiple sites were evaluated.

GHD will continue to oversee the work with Centennial, including undertaking a number of water balances, Australian and New Zealand Environment Conservation Council (ANZECC) assessments and water management plans.

A GHD team member said, ‘The viability of mines is based on a range of factors including water management. Our water assessments, which included a review of conditions according to ANZECC guidelines, allow resources companies such as Centennial to better understand the impact of water management on mine operations and sustainability requirements’.
The Australian mining exploration and support services (including equipment, technology and services) sector contributed approximately A$90 billion to the economy in 2010-2011. The industry invests significantly in research and development, and this has been crucial to developing Australia’s competitive edge in this field and contributing to its leadership in sustainable mining practices.

The Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia’s national science agency, runs the Minerals Down Under Flagship. This program uses an integrated approach to innovation across the minerals value chain in order to address the industry’s key challenges and global issues of energy, water, productivity, safety, recycling, environmental performance and social responsibility.


Australia’s rich mineral endowment has been enhanced by an ongoing commitment to build expertise at all levels of mining operations from exploration and extraction through to mineral processing, including a deep understanding of sustainability at every stage of the mine life cycle.

Australia has a formal resources and infrastructure industry training package (RII09) that can be viewed at training.gov.au/Training/Details/RII09

Skills DMC is the organisation responsible for the national competency recognition system (Training Packages) that covers the mining and resources sectors. More information can be viewed at skillsdmc.com.au

Australia has also gained a reputation for its graduate minerals-related courses and hosts numerous students from developing countries in these programs at a number of tertiary institutions. Thanks to its long history of mining education and the skills and knowledge of its mineral educators, Australia is assisting many governments to build capability, including best practices in sustainability, in their mineral sectors.
Sustainability meets virtual reality

Case study: education and innovation

The School of Mining Engineering at the University of New South Wales has constructed a virtual reality simulator called the AVIE.

A range of modules has since been developed by industry professionals to simulate various mine environments – from open-cut to underground, from hard rock to coal.

Within the safe confines of a 3D simulation, potential hazards can be safely experienced, evacuation procedures tested, and feasibility studies consolidated. The scope for industry training results in a cost-effective, low risk, high-impact learning experience.

The AVIE is also being used to simulate the environmental and social impacts of a proposed mining operation, allowing the government and the community to visualise potential impacts before mining starts.
The following table lists some examples of companies and their capabilities.

Contact your local Austrade representative for assistance with connecting with the Australian businesses that best suit your requirements.

austrade.gov.au
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INTRODUCTION

The following are some of the government and industry bodies involved in the Australian mining industry.

Contact your local Austrade representative about connecting and partnering with the Australian mining industry.

GOVERNMENT AND INDUSTRY ASSOCIATIONS

The Department of Resources, Energy and Tourism (RET) provides advice and policy support to the Australian Government regarding Australia’s resources sector. [ret.gov.au/resources/ Pages/Resources.aspx]

The Mining & Energy Services Council of Australia (MESCA) is an industry body that represents and promotes a diverse range of skilled, innovative providers which include: capital equipment, contractor and consultancy resources, OEM (Original Equipment Manufacturers) project management, engineering and MRO (Maintenance Repair & Operational) suppliers to the energy and mineral resource industries across Australia. [mesca.com.au]

The Minerals Council of Australia (MCA) represents Australia’s exploration, mining and minerals processing industry, nationally and internationally, in its contribution to sustainable development and society. [minerals.org.au]

Austmine is an industry body representing the Australian mining equipment, technology and services (METS) sector. [austmine.com.au]

AusIMM (the Minerals Institute) provides services to professionals engaged in all facets of the global minerals sector. [ausimm.com.au]

LOCAL AND INTERNATIONAL PARTNERSHIPS

The Department of Resources, Energy and Tourism (RET) lists numerous examples of Australian companies working with communities to help offset the impact of mining on indigenous communities. [ret.gov.au/resources/resources_programs/working_in_partnership/ case_studies/Pages/CaseStudies.aspx]

The Working in Partnership (WIP) initiative, managed by RET, aims to support and encourage cultural change in relations between Indigenous communities and the mining industry and promote long term, effective partnerships which benefit all stakeholders. [ret.gov.au/ resources/resources_programs/ working_in_partnership/Pages/ WorkinginPartnership.aspx]

REFERENCES


The Australian Trade Commission – Austrade – is the Australian Government’s trade, investment and education promotion agency.

Through a global network of offices, Austrade assists Australian companies to grow their international business, attracts productive foreign direct investment into Australia and promotes Australia’s education sector internationally.

Austrade helps companies around the world to source Australian goods and services. We can help you reduce the time, risk and cost involved in sourcing suppliers by:

• helping you identify and contact Australian suppliers
• providing insight on Australian capabilities
• alerting you to the latest products and services out of Australia to help you grow your business.

Austrade partners the strengths of Australian businesses with the needs of international markets. We can open the door to a world of opportunities for your business.

austrade.gov.au